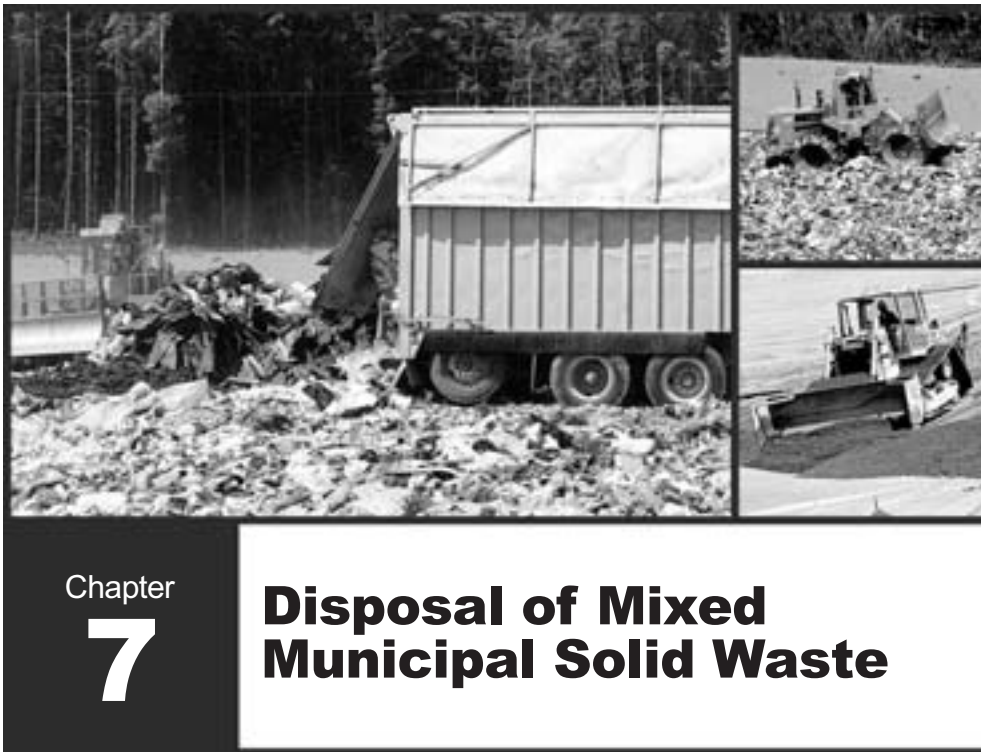


# **Appendix A**

Chapter 7 – Disposal of Mixed Municipal Solid Waste,  
and Associated Appendix D-1 (from KCSWD 2001)





King County's disposal system for mixed municipal solid waste (MMSW) comprises one active landfill – the Cedar Hills Regional Landfill – and ten closed landfills. All County landfills, both active and inactive, are designed, operated, and monitored to meet or exceed applicable federal, state, and local standards for protection of public health and the environment.

The currently active Cedar Hills Regional Landfill will reach its permitted capacity and close during this 20-year planning period. The major issue addressed in this chapter is how to provide for the disposal of MMSW in the region once this occurs. Current County policy is to initiate waste export when conditions warrant (upon approval by the King County Council), rather than siting a replacement landfill in King County. County policy also directs that the current Plan review this policy direction and recommend whether modifications are needed before implementation (KCC 10.22.025).

During development of the Plan, the public asked the County to look at a range of options and alternatives for disposal of the region's MMSW once Cedar Hills closes, as well as the timing of its closure. Three disposal alternatives were suggested for consideration – waste export, construction of a new publicly owned landfill in another county, and construction of an incinerator. Each of these alternatives was evaluated in terms of cost, feasibility, and compatibility with the region's goals and programs. Detailed results of these evaluations are provided in Appendix D. This chapter sets out the County's policies on waste disposal and looks in depth at waste export – the recommended alternative, and provides a brief description of results from the evaluation of the other two alternatives considered.

Following discussion about the future of the Cedar Hills Regional Landfill, the chapter looks at the County's long-term plan for continued management and environmental monitoring of the closed landfills throughout the region, as well as plans for the eventual beneficial reuse of these sites.

### **County Disposal Policies**

The County policies for solid waste disposal and planning for waste export are as follows:

**DSW-1.** All county landfills, both active and inactive, shall be designed, operated, and monitored to meet or exceed applicable federal, state, and local standards for protection of public health and the environment.

**DSW-2.** The county should not seek to site a replacement landfill for the Cedar Hills regional landfill in King County. Upon council approval by ordinance, the county shall initiate solid waste export.

**DSW-3.** The county shall contract for long-term disposal capacity at an out-of-county landfill or landfills. It is anticipated that export of the region's mixed municipal solid waste will begin when the Cedar Hills regional landfill has reached its permitted capacity. However, the county will remain open to considering and implementing private sector proposals for early waste export. An orderly transition to waste export should occur before Cedar Hills is closed.

**DSW-4.** The county shall continue to monitor waste export prices and the availability of landfill space and report back to the region on its findings at least annually to determine if future landfill space should be reserved and purchased in advance of use. The policy of King County shall be to monitor and analyze conditions impacting the appropriateness, feasibility and timing of waste export on a continuous basis. The executive shall report to the council at least once every three years and more if circumstances warrant on such conditions. When such conditions warrant, and upon council approval by ordinance, the division shall initiate solid waste export.

**DSW-5.** It is expected that rail hauling will be the preferred method of exporting the county's solid waste in the future. The county shall continue to monitor the long-term availability of future rail capacity to ensure that adequate transport capability exists.

**DSW-6.** The county shall plan for implementing waste export and include in the county's plan details on the sequence of phasing in waste export, the financial and staffing impacts, and the status and future capacity of rail transportation.

**DSW-7.** At least one year prior to the initiation of waste export, the county should develop comprehensive emergency response procedures for the region's waste export system.

**DSW-8.** If the need arises for the county to develop one or more such facilities, the process for siting intermodal facilities where containers are transferred from trucks to rail cars or barges shall include:

1. Involving all affected jurisdictions and interested parties in the siting process in decision making, and providing access to relevant information to affected jurisdictions and interested parties;
2. Listening and responding to input from all affected jurisdictions and interested parties; and
3. Developing jointly with all affected jurisdictions and interested parties criteria for identifying prospective sites that comprehensively evaluate environmental, technical, financial, and community needs.

**DSW-9.** The county shall continue to monitor and maintain closed landfills that fall under its jurisdiction.

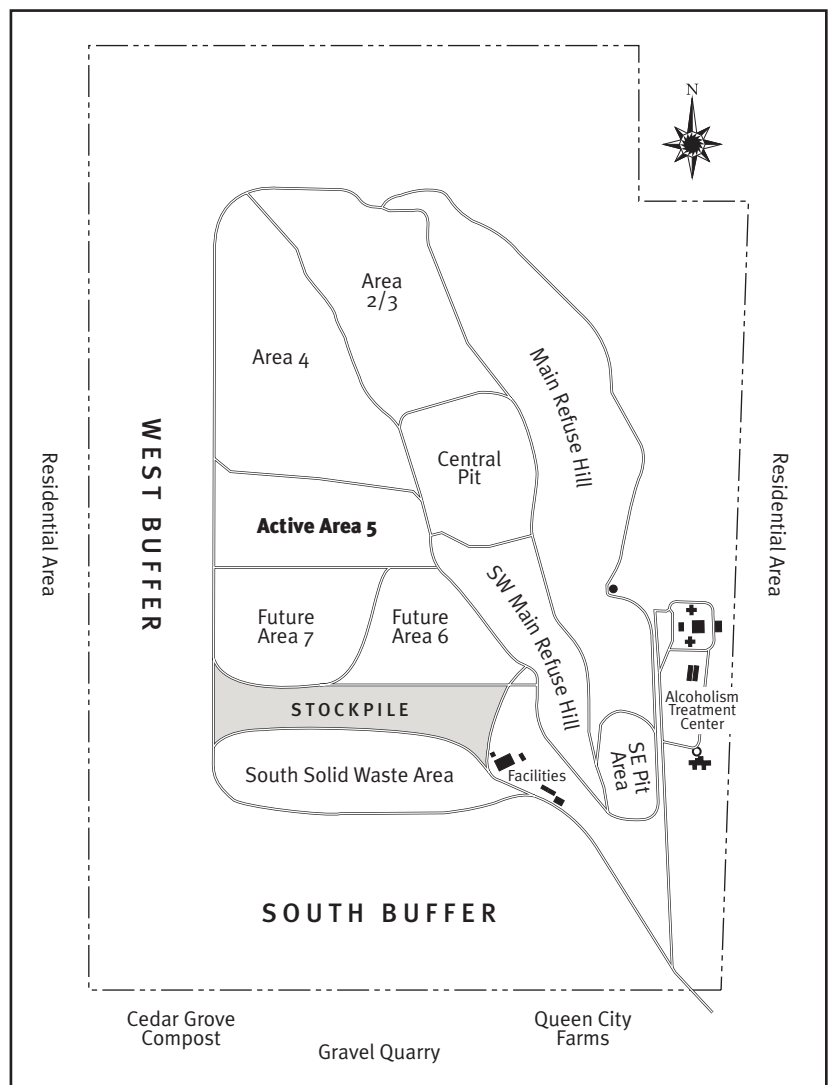
**DSW-10.** The county shall continue to work with cities, the state, and federal agencies to explore beneficial reuse options for all closed landfills. Any future monitoring or environmental system installation shall be designed to facilitate reuse of the sites.

## The Future of the Cedar Hills Regional Landfill and Waste Disposal in the Region

All of King County's mixed municipal solid waste (MMSW) is disposed at the Cedar Hills Regional Landfill. Based on County disposal data and on the design specifications contained in the *Cedar Hills Site Development Plan* (Site Plan), Cedar Hills had an estimated 12.5 million tons of remaining landfill capacity as of January 2000. The County's current waste forecast estimates that Cedar Hills will reach capacity in approximately 2012. Before that time, the County will need to select and be ready to implement an alternative system for disposing of the region's MMSW.

Operation of the Cedar Hills Regional Landfill is carried out according to an approved Site Plan. MMSW is disposed in designed cells or "Areas." Currently, MMSW is being disposed in Area 5 of the landfill. This area will receive MMSW for approximately 5 years. After that time, the Site Plan states that Areas 6 and 7 will be developed and filled sequentially until the landfill reaches permitted capacity. Figure 7-1 shows the general layout of the landfill, including the boundaries of the active and future refuse areas.

**Figure 7-1.** Layout of the Cedar Hills Regional Landfill



In developing this plan, three alternatives were evaluated for MMSW disposal, including:

- Contracting with a landfill for disposal capacity and service – waste export (KCC 10.22.025)
- Constructing a new County-owned landfill outside of King County
- Constructing an incinerator

Replacement of Cedar Hills with another landfill in King County, or expansion beyond current planned capacity, is not considered in this Plan, because of siting obstacles and directives from the King County Council and the Executive to pursue other options.

Waste export is the alternative recommended in this Plan. Before presenting details about the selection, timing, preparation for, and implementation of waste export, the chapter discusses the two other alternatives and the reasons they are not recommended. Detailed analytical results for each alternative are provided in Appendix D.

### **Construction of a New County-Owned Landfill Outside of King County**

One alternative considered was the construction of a new landfill in another county that could be shared with the host county. It was assumed that King County would cover the costs for development and most of the operations of the landfill. Four counties in eastern Washington were looked to as possible partners – Chelan, Douglas, Kittitas, and Yakima. These counties were considered for the following reasons:

- The cost of land in these counties is well below that in King County
- The population density is lower and large tracts of land are available
- The annual rainfall is substantially lower, reducing the cost of landfill management
- Development costs, including siting and permitting, are lower in these regions than in King County
- Proximity to these counties would minimize transportation costs



▲  
*Area 5 of the Cedar Hills  
Regional Landfill*

Representatives from each of the four counties were contacted regarding their long-term disposal capacity needs and plans. It was found that all four counties had long-term disposal plans in place and were not considering other alternatives at this time. Chelan and Douglas Counties are already sharing landfill space at a privately operated site in Douglas County that has more than 10 years of remaining capacity. Kittitas County is moving to waste export, and Yakima County has sufficient landfill space to serve their needs for approximately 10 to 20 more years. Since there was no mutual benefit for siting a landfill in any of these counties, this alternative was not considered further.

## Construction of an Incinerator

Incineration of solid waste was studied thoroughly in the 1970s and 1980s to reduce the volume of waste disposed. The proposition met with considerable opposition from the public because of concerns about the potential environmental impacts of ash and air emissions. As a result, the King County Council and the Executive decided to pursue behavioral changes rather than capital programs to reduce waste volumes. They then redirected the focus of County policy to waste reduction and recycling as the priority methods of handling solid waste (KCC 10.22.035).

In the development of this Plan, the County was asked to look at incineration again to see if there have been changes in the technology over the last decade that would address environmental concerns or compatibility with the region's focus on waste reduction and recycling.

The County looked at cost and performance data for incinerators operating in Spokane and Marion County, Oregon. A separate review was also conducted of the incineration industry nationwide to provide additional information about cost and performance, as well as the compatibility of incineration with waste reduction and recycling programs. Results from these reviews support the conclusion that incineration is not a feasible alternative for the region at this time. Findings of the reviews can be summarized as follows (see Appendices D-1 and D-3 for more detail):

- A review of capital costs for the Spokane and Marion County incinerators, as well as others, and an estimate of capacity needed for the region, indicate that the cost of constructing an incinerator would be at least \$150 million. This cost would have to be paid entirely by ratepayers because state grants that were available in the 1980s to help fund alternative disposal technologies are no longer available.
- Historically, the operational costs of incinerators are not fully offset by the sale of generated electricity. Though current wholesale prices are very high, there is no evidence to suggest that incinerators can operate cost effectively in this region over the long term.
- A national review of incinerator performance data and information shows that approximately 10 to 30 percent of the incinerated waste remains as residual ash that must be disposed; in addition, approximately 15 percent of the solid waste stream is non-combustible. For King County, this would mean 250,000 to 450,000 tons per year of residual ash and solid waste would still require disposal in a landfill.
- A review of literature on incineration and recycling shows that most of the combustible portion of the waste stream consists of newspaper, mixed paper, and yard waste (including wood waste), materials that are currently recycled. Pulling these materials back into the waste stream to fuel combustion is incompatible with adopted waste reduction and recycling goals. Without combustible waste for fuel, incineration requires substantial amounts of other types of fuel.



▲  
*A waste to energy  
facility operating in  
Spokane County*



- The reviews conducted for this Plan did not identify any advancement in technology that would affect ash generation, air emissions, or other aspects of environmental performance for incinerators. Therefore, public opposition to incinerators would likely be as strong as it was in the 1980s.



### Waste Export

Adopted County policy states, in part, that the County should initiate waste export when conditions warrant, and after Council approval (KCC 10.22.025). County policy also directs that this Plan review the waste export market before a recommendation is submitted to implement it.

In developing this Plan, the Solid Waste Division conducted a comprehensive review of waste export to determine whether it is cost effective, operationally feasible, and consistent with adopted goals for waste reduction and recycling. The City of Seattle and Snohomish County, where waste export has been the primary means of MMSW disposal since the early 1990s, were used as a basis for the evaluation. Representatives from the City of Seattle and Snohomish County provided detailed information about their waste export systems and their existing waste export contracts. Based on this review, waste export was deemed the most feasible alternative for future MMSW disposal in the King County regional system. A summary of the review follows; additional details are provided in Appendix D.

Both the City of Seattle and Snohomish County reported that their waste export contracts require or provide incentives for compacting wastes prior to export. The compaction of wastes reduces the volume and consequently the cost of transport and disposal. Among the capital improvements recommended in this Plan (Chapter 6) is to install compactors at the County's transfer stations prior to the closure of Cedar Hills. For a waste export contract similar to Seattle's, the estimated per ton fee for compacted waste in 2012 would be approximately \$37.50 (in year 2000 dollars). The actual cost per ton will vary depending primarily on market forces; however, recent trends have shown a decrease in the per ton cost of landfill disposal, reflecting increases in landfill space in the Northwest region and other factors. Based on this review, the cost of waste export is significantly less than the cost for other disposal alternatives evaluated in this chapter.

In addition to being the lowest cost alternative among the three considered, waste export offers other advantages. Information provided by Regional Disposal Company (that operates the Roosevelt Landfill in Washington), Waste Management Inc. (that operates the Columbia Ridge Landfill in Oregon), and Waste Connections Inc. (that



▲  
Containers full of MMSW from the City of Seattle are hoisted onto a train for export to a landfill in Oregon



operates the Finley Buttes Landfill in Oregon) indicates that between 50 and 100 years of landfill capacity exists at each one of these landfills. Their capacity estimates also assume growth in tonnage at each landfill over time.

Competition in the export market extends beyond these three existing landfills in southeastern Washington and northeastern Oregon. Information obtained from the Solid Waste Association of North America shows that publicly and privately owned landfills capable of receiving waste by rail are operating, planned, or under construction in Utah, Idaho, California, and elsewhere in eastern Washington.

Although exporting waste beyond the Northwest may sound costly, distance traveled is actually a very small component of transport costs. A review of the City of Seattle and Snohomish County waste export contracts found that the incremental cost of miles traveled is a negligible component of the contracted transport price. Disposal figures for 1999 from the Washington Department of Ecology provide further evidence of the limited impact of distance on transport costs. The figures show that the Roosevelt Landfill received approximately 174,000 tons of waste from Napa Valley, California. While numerous landfills in California are closer to Napa Valley, the Roosevelt Landfill was able to offer a competitive price that made export cost effective. The presence of abundant landfill space in the western states demonstrates that waste export will remain feasible for at least the next 20 years.

Waste export is also compatible with the adopted waste reduction and recycling goals and programs. Disposal via waste export is expected to cost at least \$10 per ton more than disposal at the Cedar Hills Regional Landfill. The additional cost per ton of exporting waste will provide additional incentives for residents and businesses to reduce the MMSW stream through reuse and recycling.

The closure of Cedar Hills and implementation of waste export will eliminate jobs related to landfill operations. A task force has already been formed to develop a transition plan to deal with changes in staffing and operations.

Several issues remain about when and how to implement waste export. Questions addressed in the Plan and to be reevaluated in the next planning cycle regarding the timing of waste export include:

- Should the County implement waste export before Cedar Hills reaches its permitted capacity?
- Should the County implement a system of partial waste export, delaying the closure of Cedar Hills?
- Should the County purchase future landfill space now?
- Should the County implement waste export on its own, or in coordination with the City of Seattle or adjacent counties?

Questions regarding how to implement waste export include:

- How will an intermodal yard or yards be sited (sites where transfer containers are shifted from trucks to rail cars or barges)?
- Will there be adequate regional rail capacity in 2012 when Cedar Hills is projected to close?
- Should the County export to a single landfill or multiple landfills?
- Would a combined contract for waste export and disposal leave the County vulnerable to price gouging?

Each of these questions is addressed below.



▲  
*Liners installed during the construction of new disposal areas preserve the quality of our environment*

### **Should the County implement waste export before Cedar Hills reaches its permitted capacity?**

Determining whether to close the Cedar Hills Regional Landfill early (before it reaches its permitted capacity) requires a review of two major issues:

- The service level and rate impacts to the region
- The ability of the region to provide disposal services during and after emergencies

The Cedar Hills Regional Landfill was developed and is managed to provide the system customers with long-term disposal capacity in a manner that protects public health. As such, there are long-term liabilities that would still require funding if the landfill were to close before it reached

capacity. At the earliest, a waste export system could be put in place around 2004, when Area 5 is expected to reach capacity, by developing a temporary compaction and re-loading facility in the region until the County's transfer stations can be modified for waste export (discussed in Chapter 6). To determine the cost implications of moving to early waste export in 2004, the County conducted an analysis of the costs of waste export measured against the cost savings of no longer operating Cedar Hills. This analysis showed that closing Cedar Hills early would require rates to increase to cover the cost of waste export. Disposal rates would also have to increase to pay for the closure and post-closure maintenance of Cedar Hills, which would have to be paid eight years earlier than planned. Combined with the cost of implementing waste export, the cost to ratepayers would be approximately \$99 million or \$16 per ton (in 2000 dollars) between 2004 and 2012 (the projected date when Cedar Hills would otherwise reach capacity). The earlier Cedar Hills closes the greater the rate impact would be at the time of closure. If ratepayers were unwilling to pay these higher disposal fees, other services would have to be drastically cut back to fund the unavoidable costs of closure and post-closure maintenance and waste export. In closing, the analysis demonstrates that early closure could compromise service levels within the solid waste system and would be costly to the ratepayers. Detailed assumptions and methods used in this analysis are

presented in Appendix D-2. While this Plan recommends that Cedar Hills be used as the primary disposal facility for King County until it reaches its permitted capacity, the County will remain open to considering and implementing private-sector proposals for early waste export.

The County also conducted a separate review to determine whether it would be beneficial to close Cedar Hills early and preserve a portion of the landfill to ensure disposal capacity in the event of an emergency. Snohomish County's experiences with waste export and emergency preparedness were used as a basis for the review.

Nearly 10 years ago, Snohomish County permitted a new landfill and constructed a cell specifically for back-up capacity in the event of an emergency. To date, the County has not used the cell and does not foresee needing it in the future for its intended purpose. This latter conclusion is supported by a recently completed emergency response study for Snohomish County's solid waste operations. The study, conducted by SCS Engineers, considered the impacts of a full range of potential emergency situations ranging from seasonal storms, mud slides, train derailments, and labor strikes, to major subduction zone earthquakes. The study found that most potential emergencies would last only a few days to a week. The study also determined that emergency response procedures that are already in place for the County's waste export system are more than adequate for handling temporary disruptions in normal transfer and disposal services.

The only emergency expected to affect waste export services for longer than a week is a subduction zone earthquake. The debris from this type of an event would come primarily from collapsing buildings and other structures. Based on a review of experiences in southern California, the volume of MMSW generated in such a situation is expected to decrease, primarily because businesses close down and households consume less. Following a major earthquake, the Burlington Northern Santa Fe Railway projects it would need 2 to 3 weeks to restore rail service in the Northwest. Again, existing emergency response procedures within the Snohomish County waste export system are projected to be able to handle the volumes of MMSW that would need to be disposed in the interim. The standard method for managing debris from damaged and collapsed structures after an emergency is to stockpile and recycle it rather than dispose of it. Recent experience with the Northridge earthquake in the Los Angeles area and with hurricanes in south Florida has demonstrated the effectiveness of relying on recycling rather than disposal to manage this type of debris.

Snohomish County's emergency response plan also notes that activating a back-up in-county landfill requires mobilization time, staff, and start-up costs to acquire equipment and staff capable of operating a landfill.

The emergency plan and procedures used by Snohomish County can be applied to King County's regional solid waste handling system. King County would be subject to the same types of emergencies and mobilization and start-up costs during an emer-



One of the more than  
100 trailer loads of  
garbage delivered to  
Cedar Hills daily

gency. Based on Snohomish County's experience, King County's recommendation is to develop comprehensive emergency response procedures for the region's waste export system and have them in place by the time waste export is implemented.



▲  
*South Park Landfill, one  
of the closed landfills  
managed by King County*

### **Should the County implement a system of partial waste export, delaying the closure of Cedar Hills?**

Rather than implement waste export after Cedar Hills reaches capacity, the County could choose to extend the life of the landfill by beginning to export a portion of its MMSW at an earlier date.

In 1995, the County developed a detailed, dynamic model to determine whether it would be cost effective to County ratepayers to export waste rather than continue to use Cedar Hills for its remaining life (described in Appendix D-4). This model also investigated whether it would be cost effective for the County to export waste from certain transfer stations and, in so doing, extend the life of Cedar Hills.

The model estimated the net costs or savings associated with various early export scenarios, compared to relying solely on Cedar Hills for disposal until it reaches capacity. In any partial waste export scenario some costs would be saved, such as the cost of hauling waste to an intermodal facility rather than Cedar Hills, while some additional costs would be incurred, such as the additional per ton cost of waste export. Key factors in the model included the fixed costs of operating Cedar Hills, the variable (per ton) costs of disposing waste at Cedar Hills, the short-haul transport costs of hauling waste from transfer stations to Cedar Hills, the cost of developing and closing new areas of the landfill, the remaining capacity of Cedar Hills, and the per ton costs of waste export. Notably, some of the assumptions used in the model favored waste export, such as a relatively high estimate of tons per load exported and a relatively low estimate of truck turnaround times at an intermodal facility.

The 1995 modeling effort demonstrated that early or partial waste export would not be cost-effective for County ratepayers. Cedar Hills operates most efficiently at higher rates of disposal. Thus, any cost savings associated with not using Cedar Hills for a share of the system's waste is more than offset by the additional costs associated with exporting waste out of the County.

All partial waste export scenarios modeled were more costly than using Cedar Hills until it reached capacity. Simply stated – the study found that the more waste exported before Cedar Hills was filled, the more ratepayers would have to pay or the more services would have to be cut back to cover the higher disposal costs. The recommendation was made not to pursue any partial or early waste export to make the most efficient and cost-effective use of Cedar Hills (Appendix D-4). Because of the importance of the recommendation, two independent consultants reviewed the model – one hired by the County and the other by potential waste export firms. Both reviews found the model sound.



Given the model results and the fact that waste export and in-county disposal costs are relatively unchanged, there is no rate benefit to initiating partial waste export. However, as the date approaches when Cedar Hills reaches capacity, the County will need to determine how the transition to waste export can be achieved most efficiently. This will require a thorough analysis that begins well in advance of closure. In addition, consistent with County policy, the timing of waste export will be reexamined annually, with reports to the King County Council on the findings. The County will remain open to considering and implementing export early should circumstances warrant.



### **Should the County purchase future landfill space now?**

Posed another way, would it be advantageous to purchase landfill space sooner, in case landfill prices rise over time? To determine if this trend is likely, the County reviewed landfill prices for the Roosevelt and Columbia Ridge Landfills for the last 5 to 10 years. The County also conducted a brief survey of landfill capacity in the western United States and a cost analysis of waste transport to determine if there are market forces at work that could drive landfill prices up.

When waste export began locally in the early 1990s, contracted disposal prices at landfills in the Northwest were between \$23 and \$26 per ton (excluding transport costs). As waste export activity has increased during the decade, disposal prices have declined. Today, contracted disposal costs at Roosevelt and Columbia Ridge are less than \$20 per ton.

It appears there is sufficient landfill space available in the Northwest (Roosevelt Landfill in Washington and Columbia Ridge and Finley Buttes Landfills in Oregon), as well as in Idaho, Utah, and California, to keep the industry competitive. Exporting MMSW to landfills in these other states is a viable option. A review of the City of Seattle and Snohomish County waste export contracts revealed that the incremental cost of miles traveled back and forth between the community served and the landfill site is negligible (Appendix D-1).

The early purchase of future landfill space appears to be cost effective only if the price for landfill space increases over time. Since the opposite trend is occurring, this option need not be pursued at this time; however, the County will continue to monitor waste export prices and the availability of landfill space and report back to the region on its findings at least annually.

### **Should the County implement waste export on its own, or in coordination with the City of Seattle or adjacent counties?**

The City of Seattle is already exporting its waste to the Columbia Ridge Landfill. Snohomish County also exports its waste, but to the Roosevelt Landfill. The volume of waste exported by these two jurisdictions is approximately equal to the volume of waste that the County will need to export. Opportunities may exist for King County to coor-

▲  
*Cedar Hills will reach its  
permitted capacity in  
about 2012*

dinate with Seattle, Snohomish County, or other jurisdictions in implementing waste export. A coordinated waste export system with another or multiple jurisdictions could lead to greater economies of scale in contract costs, lower costs for intermodal facilities if they could be shared, and lower costs for ratepayers. As an initial step, the County will develop a detailed waste export implementation and coordination plan. The plan will address specific issues covering the timing of waste export, capacity and facility needs, and intermodal yard needs, as well as answers to questions about the feasibility, costs, and benefits of possible joint operations with adjacent counties and other jurisdictions.

### **How will an intermodal yard or yards be sited (sites where transfer containers are shifted from trucks to rail cars or barges)?**

During Plan development, the cities asked that they have input in the process of siting an intermodal yard – or yards. Primarily, they want to help ensure that no one jurisdiction has to absorb a disproportionate amount of waste and truck traffic.

The methods available for exporting the region's waste include rail hauling, barging, or trucking waste to an out-of-region landfill. Rail hauling or barging will require an intermodal facility (or facilities) where loaded transfer containers are shifted from trucks to either rail cars or barges.

Given that there are 37 cities in the regional solid waste system, decisions about the method of waste export, and decisions about the siting of intermodal facilities (whether by rail or barge), should be made jointly. The region has several years to discuss and decide how and where these facilities will be sited.

If the need arises for the County to develop one or more intermodal facilities, the process for siting these facilities shall include:

- Involving all affected jurisdictions and interested parties in the siting process decisions and providing access to relevant information to affected jurisdictions and interested parties
- Listening and responding to input from all affected jurisdictions and interested parties
- Developing jointly with all affected jurisdictions and interested parties all criteria for identifying prospective sites that comprehensively evaluate environmental, technical, financial, and community needs



▲  
*The City of Seattle and Snohomish County currently rail haul their solid wastes*

### **Will there be adequate regional rail capacity in 2012 when Cedar Hills is projected to close?**

Because of cost and other considerations, it is likely that rail hauling will be the preferred method of exporting waste in the future. Since rail transport is limited to a small number of rail lines, the Solid Waste Division estimated and briefly analyzed future rail capacity needs.

Both the City of Seattle and Snohomish County, who currently contract for waste export (disposal and transport), use rail hauling as their transport method. Their experi-

ence with waste export provides a model for calculating the region's needs for rail capacity should rail hauling be the selected method of export in 2012. Assuming the County would have a comparable train container payload and require a similar train size as the City of Seattle, it is estimated that approximately 8 to 10 trains per week, consisting of about 100 containers per train, would be needed to haul the County's waste from 2012 to 2020.

Solid Waste Division staff discussed these future rail needs with a representative from the Port of Seattle, who was knowledgeable about the regional intermodal transportation infrastructure and general trends in railway capacity, and representatives from the Burlington Northern Santa Fe Railway, which owns a significant portion of the rail lines in the region. The following information was gathered from those discussions:

- The year 2012 – when Cedar Hills is currently anticipated to reach capacity and the County proposes to begin waste export – is beyond the typical planning time frame of the railway industry.
- The additional trains needed for rail hauling in the County would not significantly increase current rail traffic. The additional trains would represent only about a 4 percent increase in the current volume of daily rail traffic through the Burlington Northern Santa Fe Railway main rail yard in south Seattle.
- Both the Port and railroad representatives indicate that adequate main line capacity will be available to export the region's waste in 2012. Three major east-west main lines for rail haul routes currently exist: 1) north through Stevens Pass, 2) through Stampede Pass, and 3) south along the Columbia River Gorge. These routes have the capacity to handle additional freight trains throughout the foreseeable future.

The County will continue to monitor the long-term availability of future rail capacity to ensure that adequate rail capacity actually exists when it is needed. Additionally, the County will need to address many other specific issues, including adequate availability of rail containers. A discussion of how existing transfer station facilities will be upgraded to be compatible with waste export, including a strategy for installation of waste compactors to support efficient long hauling of waste, and consideration of the most effective means of transporting waste from transfer stations to rail lines, such as the development of rail spurs to support such a transfer, will occur after the adoption of this Plan.

### **Should the County export to a single landfill or multiple landfills?**

Another question with respect to waste export is whether to export to a single landfill or to multiple landfills. Having one landfill may be more cost effective, if there are economies of scale that favor using one transport system and taking MMSW to only one landfill. On the other hand, having multiple landfills may provide some assurance that the County's MMSW disposal needs will be met, even if one of the landfills is unexpectedly closed. The answer to this question will depend on future market conditions and the interest among prospective landfill contractors in providing MMSW disposal services. This issue is best addressed during the contract procurement process, as Cedar Hills nears capacity and waste export becomes more imminent.



### **Would a combined contract for waste export and disposal leave the County vulnerable to price gouging?**

Concern has been expressed that combining both waste export and disposal into one contract would make the County vulnerable to price gouging from railroads because there are only two rail providers in the region. Waste export is the combined activity of transporting and then disposing of collected solid waste. The method of export is most often via rail, but can also involve barging or long-haul trucking. All three methods of export are in use now in Oregon and Washington.

For all methods of export, the landfill contractor must be able to work efficiently with the transport contractor on a daily basis. Therefore, the common practice is for local governments to issue a single request for bids or proposals for waste export services that include both transport and disposal. There are several reasons that this approach is practical and efficient:

- The landfill contractor can select a cost-competitive transport contractor to include in a single bid or proposal. It is in the best interests of both contractors to work out a competitive price for waste export services in order to have a chance at a winning bid or proposal.
- Once a waste export contract is signed and implemented, day-to-day logistical matters and other details become the responsibility of the landfill contractor – not the County.
- The County will have a single point of contact (usually the landfill contractor) for all issues related to contract management and compliance.

The County will continue to monitor current market forces and contract management issues until such time as a waste export contract is negotiated.

### **Summary**

The Plan directs implementation of waste export as follows:

- The region's MMSW will be disposed at the Cedar Hills Regional Landfill until it reaches its permitted capacity in approximately 2012
- The County will contract for long-term disposal capacity at an out-of-county landfill(s) and begin exporting its MMSW after Cedar Hills closes
- The County will develop an emergency response and back-up plan as part of preparing for waste export
- The County will continue to monitor waste export prices and the availability of landfill space and report back at least annually
- The County will work with the cities during the siting process for intermodal yards, if they are required
- The County will continue to monitor the long-term availability of future rail capacity

- The County will prepare a detailed waste export implementation and coordination plan that will address the possibility of joint operations with adjacent counties or other jurisdictions
- Decisions about the number of landfills to contract with will be made during the contract procurement process
- The County will study pricing and contract issues before determining whether to negotiate a single contract for export and disposal
- The County will consider initiating waste export earlier than 2012 if circumstances warrant

## **Management of the County's Closed Landfills**

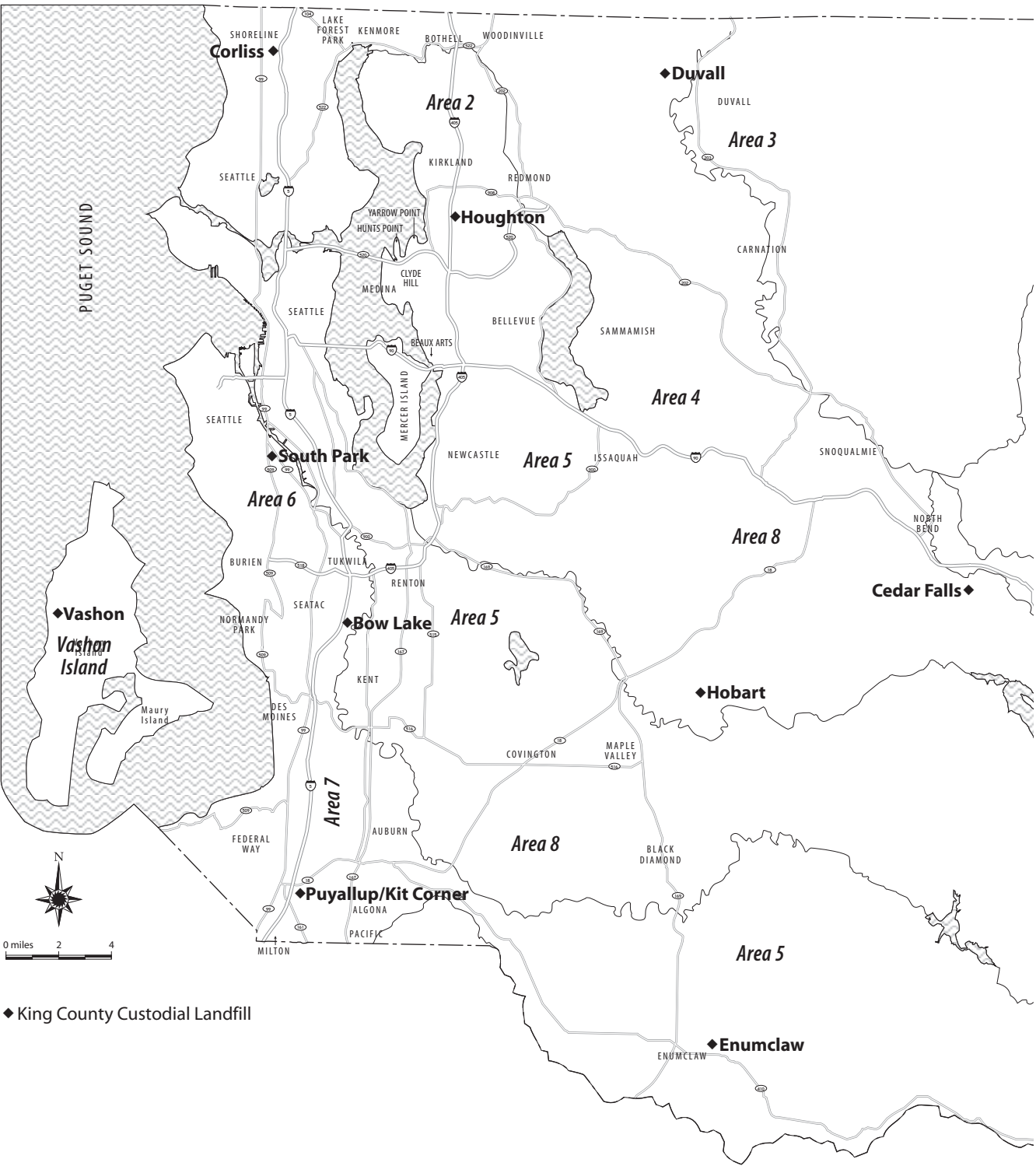
King County maintains ten closed landfills throughout the region (Figure 7-2). The landfills closed at various times over the last 30 years. In the late 1960s and 1970s, the Corliss, Bow Lake, Houghton, Puyallup/Kit Corner, and South Park Landfills were closed. The Duvall Landfill was closed in 1981. The Cedar Falls, Enumclaw, and Hobart Landfills were closed within the last 10 to 15 years. Most recently closed was the Vashon Landfill, which stopped accepting waste in 1999.

The Solid Waste Division monitors groundwater, surface water, wastewater, and landfill gas at all ten of the County's closed landfills. Since 1972, federal and state requirements for the management of closed landfill sites have become more stringent. In response, environmental monitoring programs have been stepped up with more monitoring stations and a broader scope of chemical analyses. These changes have also led to increases in reporting requirements.

Under the Solid Waste Division's current monitoring program, samples are collected from more than 180 groundwater, surface water, and wastewater monitoring stations and approximately 100 landfill gas monitoring stations. Monitoring samples are collected on a monthly or quarterly schedule, depending on the medium. These data are summarized in quarterly and annual reports submitted to the Washington Department of Ecology and Public Health – Seattle & King County. The Health Department also routinely inspects all of the closed landfills.

A brief summary of the past, current, and future activities at the sites is provided in Table 7-1.

Figure 7-2. Locations of the County’s Closed Landfills



**Table 7-1.** Status of the County's Closed Landfills

Landfill	Year Closed	Environmental Systems in Place	Current and Future Programs
Bow Lake	mid-1960s	Preliminary studies conducted in 1985 and 1986 indicated the site did not require monitoring systems	Continuing routine inspections to monitor for changes in conditions
Corliss	mid-1960s	Preliminary studies conducted in 1985 and 1986 indicated the site did not require monitoring systems	Continuing routine inspections to monitor for changes in conditions
Houghton	mid-1960s	Landfill gas extraction; ground-water and landfill gas monitoring	Lease signed in March 1999 to develop athletic fields at the site; continuing monitoring and maintenance of environmental systems
Puyallup/ Kit Corner	mid-1960s	Landfill gas extraction; ground-water and landfill gas monitoring; vegetative landfill cover	Continuing monitoring and maintenance of environmental systems
South Park	1978	Groundwater, surface water, and landfill gas monitoring	Site being marketed for sale and development under King County Council Motion 9885 for industrial uses; continuing monitoring and maintenance of environmental systems
Duvall	1981	Leachate collection; groundwater, surface water, and landfill gas monitoring; soil cover	Groundwater wells installed to expand existing network; gas probes installed to monitor sub-surface landfill gas; vegetative landfill cover to be constructed to improve existing cover's ability to reduce surface water infiltration through the refuse, and monitoring; continuing monitoring and maintenance of environmental systems; evaluating the existing leachate collection system

The County continues to examine possibilities for the beneficial reuse of closed landfills in the region. The presence of monitoring equipment at these landfills can limit the types of beneficial reuse projects that can be implemented. As programs and monitoring are expanded at these sites, the County is designing systems with beneficial reuse in mind.

Recent examples of reuse projects include:

- **Duvall Landfill** – The County has installed an 800 MHz radio tower outside of the refuse boundary of the site as part of the Emergency Communications Project.

**Table 7-1.** *continued*

Landfill	Year Closed	Environmental Systems in Place	Current and Future Programs
Cedar Falls	1989	Passive gas collection; groundwater, surface water, and landfill gas monitoring; composite cover system	Additional groundwater wells recently installed; routine evaluations of the passive gas collection system being conducted; continuing monitoring and maintenance of environmental systems
Enumclaw	1993	Landfill gas extraction; leachate collection; stormwater drainage; groundwater, surface water, and landfill gas monitoring; composite cover system	Continuing monitoring and maintenance of environmental systems
Hobart	1994	Landfill gas extraction; leachate extraction and collection; groundwater and landfill gas monitoring; groundwater cutoff well; composite cover system	Continuing monitoring and maintenance of environmental systems
Vashon	1999	Landfill gas extraction; leachate collection; stormwater drainage; groundwater, surface water, and landfill gas monitoring; composite cover system	Temporary cover is being replaced with final cover; controls planned include an expansion of active landfill gas extraction, leachate collection, and stormwater detention systems, and groundwater, surface water, and landfill gas monitoring networks; continuing monitoring and maintenance of environmental systems

- **Houghton Landfill** – A lease was signed in March 1999 to develop athletic fields at the former Houghton landfill site. Environmental investigations at the site conducted by the County and independently verified by the Health Department, University of Washington Environmental Health Department, and the Agency for Toxic Substance and Disease Registry (within the U.S. Environmental Protection Agency) found that recreational use would not pose a threat to public health or safety.
- **South Park Landfill** – The County is marketing this site and investigating possibilities for developing the area for industrial uses. A site developer is being selected in 2001/2002.

- **Open Space Preservation** – All closed landfill sites represent open space that can be used for habitat. Sites are open grassy areas and some are adjacent to woods. Sites that are already providing habitat for birds and other migratory animals are the Duvall and Cedar Falls landfill sites. Both are in the headwaters of significant streams and provide cover and a source of food for birds. Management of these and the other sites as open space helps to support the County’s goals and policies for open space and habitat preservation.



### **Recommendations**

Extensive environmental monitoring and mitigation systems are in place at the County’s closed landfills. Current practices are intended to assist the County in complying with regulatory requirements for these sites. The County will continue to monitor and maintain the landfills as needed.

The County will continue to explore beneficial reuse options for all closed landfill sites whenever it might benefit the community without posing a threat to public health and safety. The Solid Waste Division is working in close coordination with city, County, state and federal agencies, and the public to identify possible reuse options. Any future monitoring or environmental system installation will be designed to facilitate reuse of the sites.

The County also will work to convert landfill gas, the gas produced by the microbial decomposition of municipal solid waste, into a marketable energy product as soon as possible.

D-1      Analysis of Disposal  
Options Technical Paper



# **Analysis of Disposal Options Technical Paper**

## **I. Introduction – Purpose**

This Technical paper contains the analysis of disposal option considered in Chapter 7 of the 2000 Comprehensive Solid Waste Management Plan. The paper summarizes the analyses conducted to determine the most cost-effective post-closure disposal alternatives for the Cedar Hills Regional Landfill.

## **II. Remaining Permitted Capacity at the Cedar Hills Landfill**

The Cedar Hills Landfill functions as the disposal site for nearly all of King County's MMSW and special waste. The adopted Cedar Hills Site Development Plan call for the landfill to be developed through Area 7 of the landfill site. Based on this design parameter, Cedar Hills had an estimated 12.7 million tons of remaining landfill capacity as of January 2000. The estimated time to fill the landfill to its permitted capacity (through Area 7) is 2012. This assumes that the recommended waste reduction & recycling programs described in Chapter 4 of the Plan will be implemented.

## **III. Analysis of Replacement Alternatives for the Cedar Hills Landfill**

Three replacement alternatives for Cedar Hills were identified during the public input process for the development of the Plan. They include:

- Construction of a new County-owned landfill in another county;
- Waste-to-energy incineration; and
- Contracting with an existing landfill for disposal capacity and service.

### **A. Construct A New County-Owned Landfill in Another County**

It is assumed that the replacement landfill would be located in eastern Washington because of the area is less densely populated. It is also assumed that the landfill would be for King County's use as well as the host county's use.

Economic factors and landfill capacity needs were considered for the review of this alternative.

#### Economic Factors

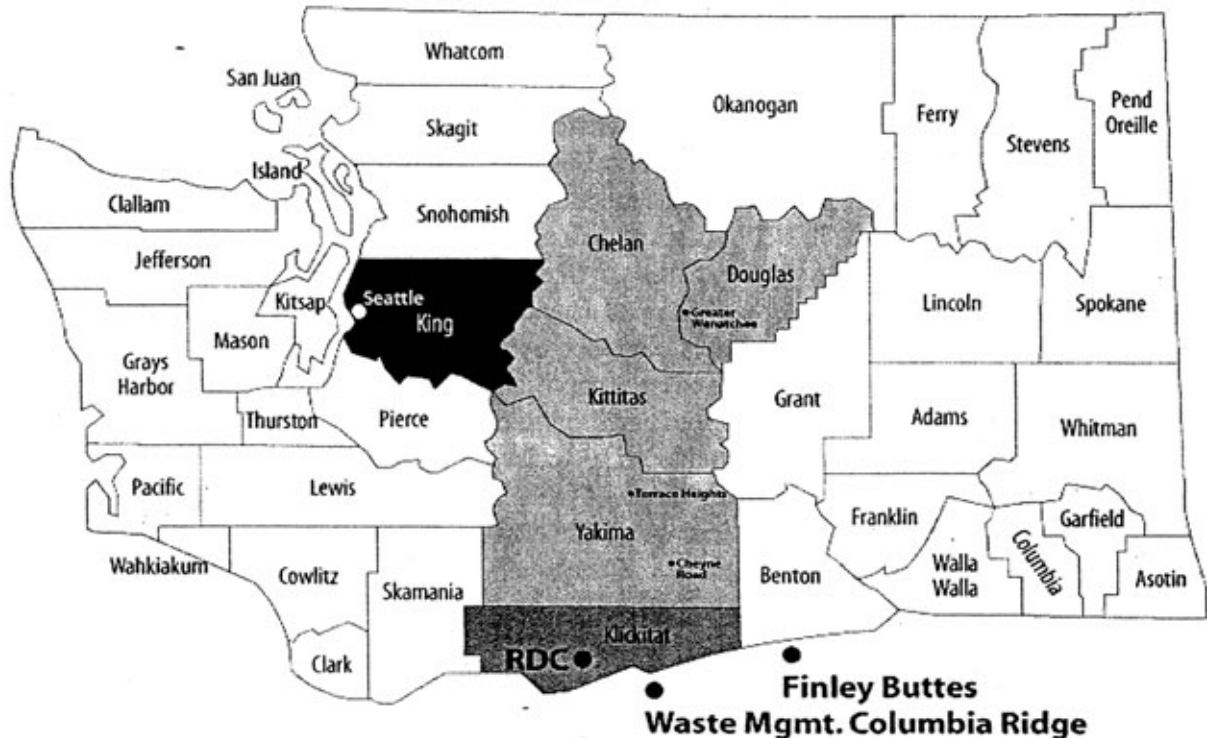
1. The cost of land in eastern Washington is well below the cost per acre in King County with large tracts of land in outlying areas selling for approximately \$300 per Acre; (Kittitas County Assessor's Office). Similar parcels in King County \$5,000-\$12,000 per acre (King County Assessor's Office).
2. Development costs (including siting and permitting) for new landfills range from \$300,000 to \$800,000 per acre (SWANA, NSWMA). An eastern Washington site should incur costs in the lower portion of this range for the following reasons:
  - Lower cost for land

- Lower population density thus fewer neighbors. This would facilitate the siting/permitting process.
  - Lower rainfall.
  - Fewer surface water controls required.
3. King County would bear the bulk, and possibly all, of the development and operation costs of this landfill.
  4. The current bid price per ton for landfills operated by Rabanco and Waste Management in Washington and Oregon is near \$20.00 per ton for contracts with Tacoma/Pierce County, City of Seattle and Spokane. This cost per ton is affected by the economies of scale at these landfills where they are each receiving approximately 4,500 tons per day. Based on the site history at the Cedar Hills Landfill and County tonnage projections for the planning period, King County could expect to handle between 2,500 and 3,000 tons per day. With this somewhat lower economy of scale, it is unlikely that County could operate a landfill in a host county at a significantly lower rate than is available at existing private landfills.

### Landfill Capacity Needs

1. The most likely candidates for forming a cooperative relationship would be eastside Washington counties that are closer to King County than existing regional landfills in Klickitat County, Gilliam County Oregon, and Morrow County Oregon (See Figure 1). These counties provide access to large tracts of developable land and could potentially provide reduced transport costs than the existing regional landfills. All four counties were contacted to determine if they had long-term disposal plans in place for their respective jurisdictions. It was found that:
  - Chelan and Douglas counties are jointly using a regional landfill located in Douglas County. The landfill is designed to handle waste flows from those two counties and has between 10 and 20 years of capacity remaining.
  - Kittitas County has closed their landfill is in the process of entering into a long-term contract to export their waste to an existing regional landfill.
  - Yakima County has two existing landfills to serve their needs for approximately 10 to 20 more years.
  - Based on the information provided from these four counties, there appears to be no need or incentive for them to have King County site and operate a landfill within their respective boarders.

**Figure 1. Landfill Capacity Near King County**



### Conclusions

Based on the a lack of evidence that significant cost savings to ratepayers, and the presence of existing long-term disposal options in those counties that are our neighbors to the east, the alternative of building a replacement landfill for Cedar Hills does not appear feasible.

### **B. Construct A Waste-To-Energy Incinerator or Incinerators**

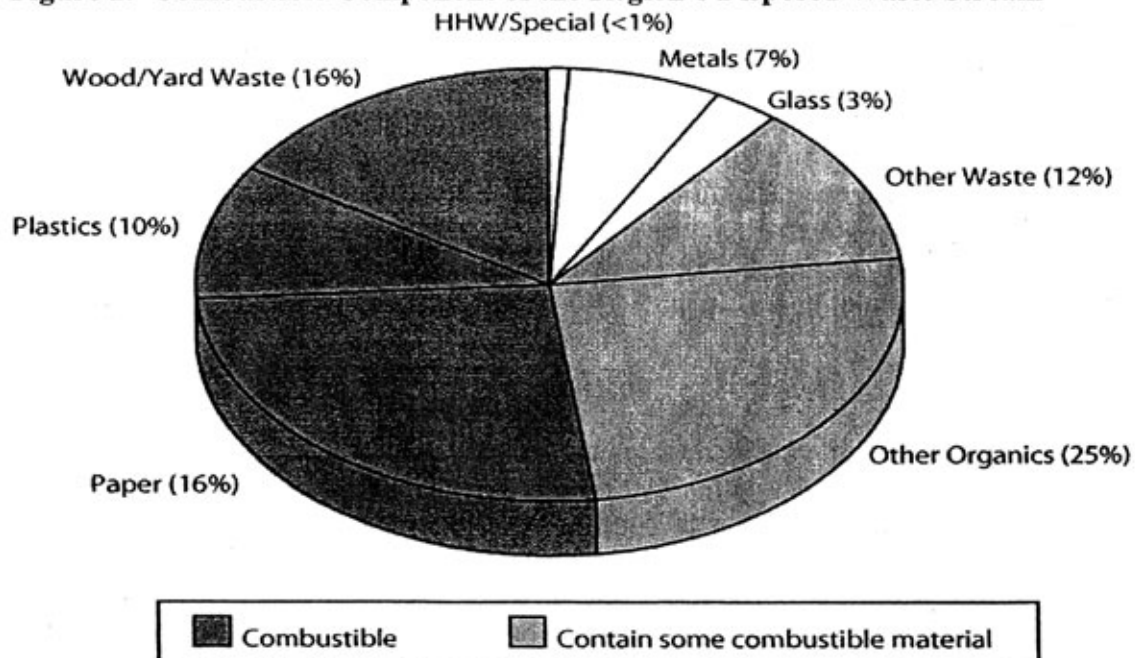
The review conducted for this Plan focused on costs associated with waste-to-energy incinerators, their compatibility with the region's established waste reduction and recycling system, and on environmental performance of existing facilities. The waste-to-energy facilities in Spokane and Marion County, Oregon were used as example facilities.

### Analysis

1. The capital costs of constructing an incinerator are in the range of \$90,000 per ton/day of burn capacity. The capital costs for the Marion County and Spokane incinerators fall in this range and total construction costs were \$47-million and \$110-million respectively. Given the larger volumes of waste that incinerators in King County would have to process, capital costs would be significantly higher.
2. Operational costs of incinerators are also only partially offset by the sale of electricity generated by the incineration process. Currently, Spokane and Marion County Oregon are receiving about \$0.04/kWh sold. They estimate that the cost of electricity would have to go up to \$0.14/kWh, or over triple its present rate in order to cover operating costs in today's' economy.

3. Regarding incinerator performance, it was found that both the Spokane and Marion County incinerators are meeting the environmental standards that are in place for each facility. However, it was also found that incineration is not a replacement for landfilling but only an interim step in the process. Industry figures show that with incineration in place, it is typical for up to 30 to 40-percent of an area's waste to be landfilled. Of the original waste stream approximately 15-percent is non-combustible. Up to 15-percent of the combustible waste may have to go to a landfill during downtime for repair and/or maintenance, and 10 to 30-percent of the incinerated waste will remain as ash residual. Though this would result in a smaller amount of waste being disposed, landfilling will still be required. Within this region, that means between 300,000 and 450,000 tons of ash and waste would still require landfilling annually, a volume approximately equal to what is disposed by the City of Seattle.
4. Incineration does not appear to be compatible with the region's waste reduction and recycling system. Newspaper, corrugated cardboard, mixed paper, and yard debris are major components of the recycling stream currently collected from residential and non-residential generators in the region. Wood waste is also a targeted material for recycling from the construction industry, and plastic, though a small percentage of the recycling stream, is also targeted for increased collection and reuse in the future. Combined, these materials make up a significant portion of combustible solid waste (see Figure 2). Operation of an incinerator in the region would induce competition between recycling markets and the incinerator operator for these materials. Competition for combustible materials seriously impacts the operating costs of incinerators. Without combustible waste for fuel, solid waste incineration requires consumption of "substantial amounts of auxiliary fuel" in order to produce electricity (Jeffery Morris Ph.D., 1996).

**Figure 2. Combustible Component of the Region's Disposed Waste Stream**



From: 1997 Waste Stream Characterization Report

Two significant issues related to incineration are not discussed here. They are the potential environmental impacts of incineration on the region; and the potentially lengthy and expensive

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process for attempting to site one or more waste-to-energy incinerators in the region. These issues have not been analyzed here because the issues discussed above show waste-to-energy as being infeasible. Environmental impact and siting analyses only seemed warranted if waste-to-energy incineration appeared to be a potentially viable alternative.

### Conclusions

The findings above demonstrate first that waste-to-energy incineration is not a replacement for landfilling. It is an interim step that produces some energy and reduces the volume of waste to be landfilled by approximately two-thirds. Additionally, the costs associated with constructing an incineration system appear to significantly outweigh the benefits, as measured by the revenue generated through the sale of electricity. Finally, the region has an established waste reduction and recycling program that is still expanding to capture and recover more materials from the disposed waste stream, most of which are combustible. Construction and operation of an incinerator would lead to competition between recyclers and the incinerator operator for these materials. Continued success in diverting materials from the disposal stream to the recycling stream would tend to reduce the operational efficiency of incinerators as well as increase their cost of operation.

### **C. Contract for Disposal (Waste Export)**

Waste export entails contracting with a vendor for the transport to and disposal of wastes at landfills outside the boundaries of a given jurisdiction. The cost and feasibility of waste export can be assessed by observing the experience of nearby jurisdictions that currently use waste export as their primary means of disposal. Since the early 1990's, several nearby jurisdictions have been using waste export as their primary means of disposal, including the City of Seattle (April 1991) and Snohomish County (April 1992).

There are several different options for waste export. The waste export option assumed for this Plan is that King County would continue to operate its existing transfer stations and short haul waste, but contract with a private hauler for long haul and disposal. The analysis of the waste export alternative considered cost, feasibility, and the availability of landfill space.

#### Cost

1. Based on a review of existing waste export contracts for the City of Seattle and Snohomish County, King County could secure a waste export contract with per ton fee for waste export of approximately \$37.50 per ton, including transport and disposal (in 2000 dollars).
2. The costs for landfill space at existing out-of-county landfills have been decreasing since the early 1990's. When waste export began in the early 1990's contracted disposal prices at the Columbia Ridge and Roosevelt landfills (see Figure 3) were between \$23 to \$26 per ton (excluding transport costs). As waste export has grown during the decade, disposal prices have declined. Today, contracted disposal prices at these same two landfills have dropped to under \$20 per ton.

#### Feasibility



1. Efficient waste export requires that waste be compacted at transfer stations prior to transport to a landfill. A review of the Seattle and Snohomish County waste export contracts shows that compacting waste reduces the cost of waste export. Both waste export contracts require or contain significant incentives for high container payloads resulting from waste compaction. The \$37.50 per ton export price discussed above assumes compacted waste would be transported and disposed. Chapter 6, Transfer, in the Plan contains alternatives for transfer station improvements. All include the installation of compactors at transfer stations, which would make waste export efficient.
2. Waste export is a proven method of waste disposal in the Northwest. Many local governments from around Washington have been exporting their waste for ten years or more (See Figure 3).

**Figure 3. Local Governments in Washington Exporting Waste**



Source: Washington State Counties Solid Waste Survey Report, July 1999

### Landfill Capacity

1. Information provided by Regional Disposal Company, which operates the Roosevelt landfill, Waste Management Inc., which operates the Columbia Ridge Landfill, and Waste Connections Inc., which operates the Finley Buttes Landfill indicates that between 50 and 100 years of landfill capacity exists at each one of these landfills. Their capacity estimates also assume a growth factor in tonnages delivered to each landfill over time.

2. Competition in the export market extends beyond the three existing landfill in eastern Washington and Oregon. Information obtained from the Solid Waste Association of North America (SWANA) shows that landfills capable of receiving waste by rail are operating or are under construction in Utah, Idaho, and California. Though it may appear too costly to export waste beyond the Northwest, distance traveled is actually a small component of transport costs. A review of the City of Seattle's and Snohomish County's existing waste export contracts found that the incremental cost of miles traveled is so small that it is lost in the components of the contracted transport price. Further evidence of the limited impact of distance on transport costs is that Department of Ecology disposal figures show that the Roosevelt Landfill receives approximately 174,000 tons of waste per year from Napa Valley California. Numerous landfills in California are closer, but the Roosevelt Landfill operators were still able to offer a competitive price.

### Conclusions

The cost of waste export is likely to be significantly lower than other disposal options particularly waste incineration (which would still result in a need for disposal). Landfill capacity is also more than adequate to meet the County's disposal needs for this 20-year planning period and beyond. Therefore, the waste export alternative should be pursued once Cedar Hills reaches capacity. This conclusion is also consistent with current County policy.